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Fraser

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(54) **HINGE ASSEMBLY FOR LID OF CONTAINER**

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E05D 3/02 (2006.01)
E05D 11/06 (2006.01)

(52) **U.S. Cl.**
CPC ***E05D 3/02*** (2013.01); ***E05D 11/06*** (2013.01); *Y10T 16/558* (2015.01); *Y10T 16/5535* (2015.01)

(58) **Field of Classification Search**
CPC Y10T 16/5535; Y10T 16/551; Y10T 16/557; Y10T 16/558; E05D 3/02; E05D 5/046; E05D 11/06; B65D 43/166; B65D 43/167; F25D 23/028
USPC 16/381, 374, 386, 387; 312/326, 405; 220/832, 848
See application file for complete search history.

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(74) *Attorney, Agent, or Firm* — Berenato & White, LLC

(57) **ABSTRACT**

A hinge assembly for pivotally connecting a lid to a receptacle of a container, comprises a first hinge half including a convex edge portion, and a second hinge half pivotally connected to the first hinge half for pivotable movement between a flattened position and a folded position of the hinge assembly. The second hinge half includes a concave nesting depression nestably engaging the convex edge portion of the first hinge half in the folded position of the hinge assembly.

20 Claims, 12 Drawing Sheets

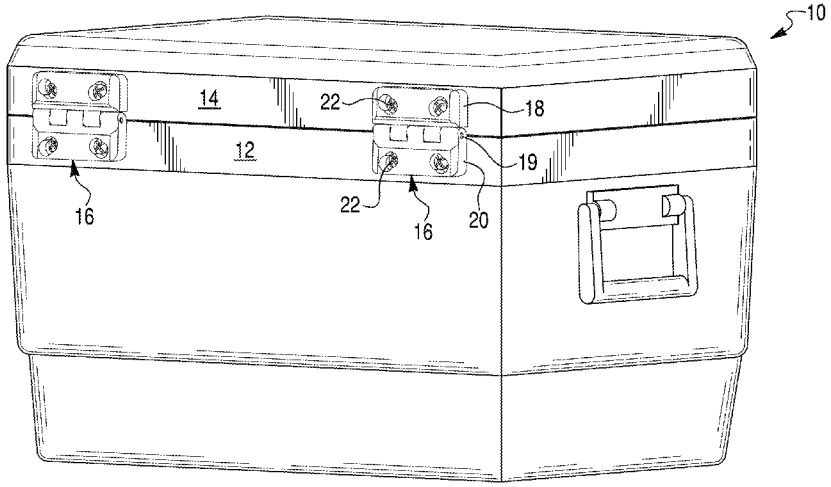

Fig. 1

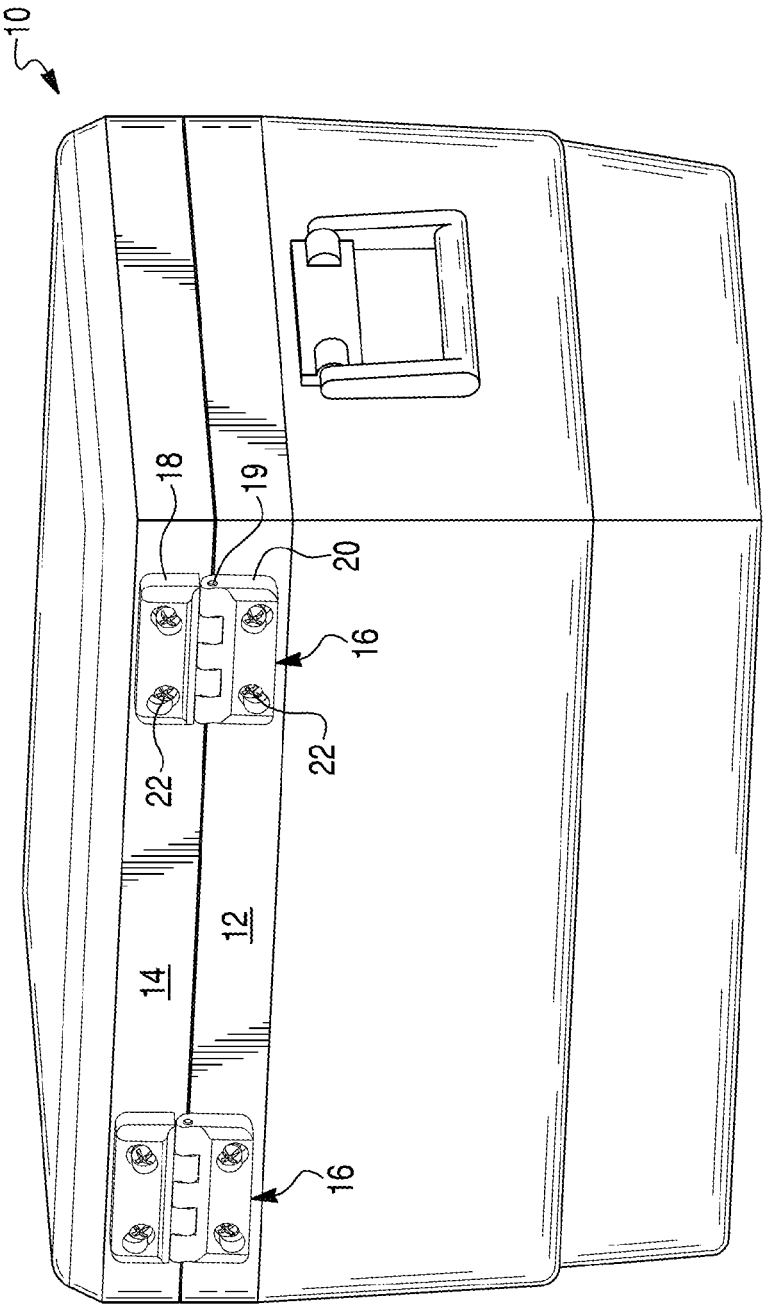

Fig. 2B

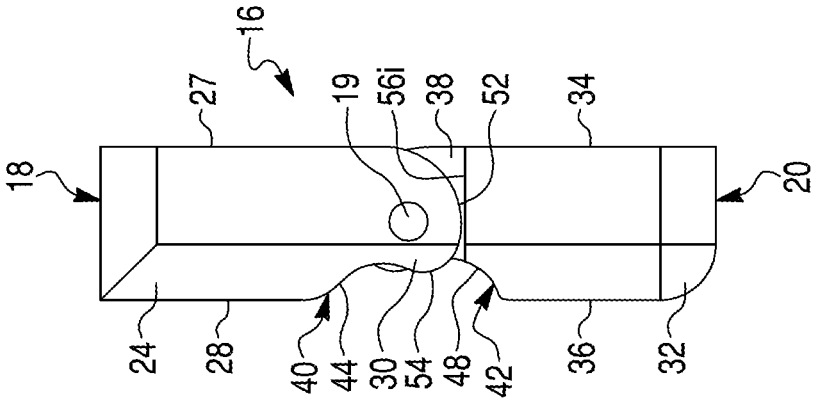
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Fig. 2A

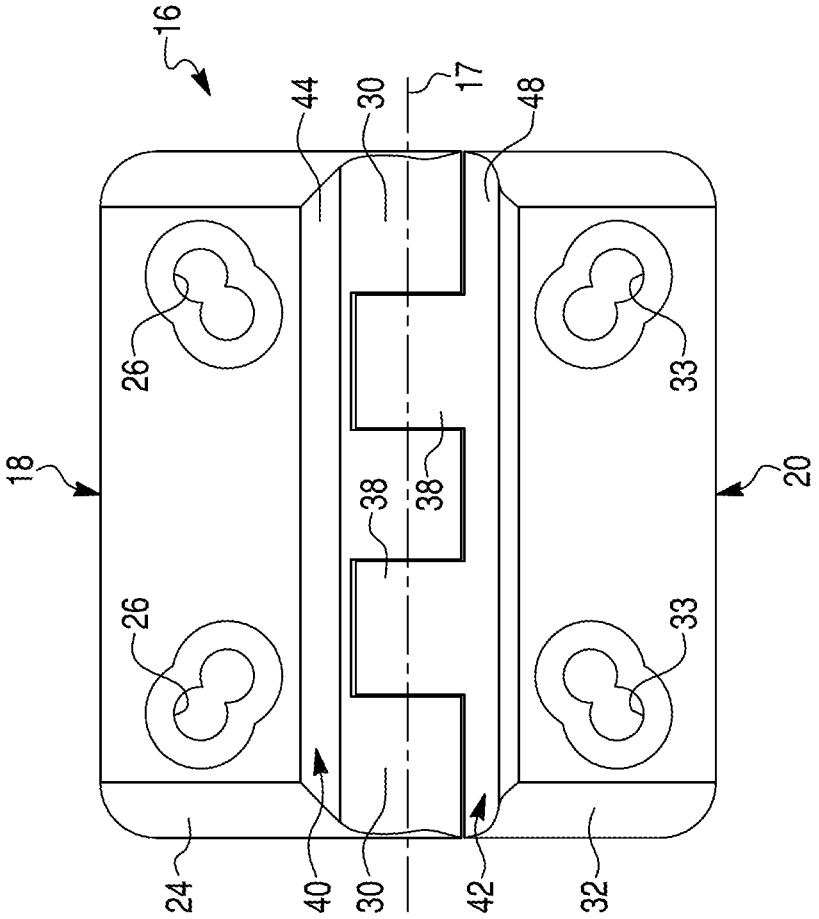
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Fig. 3B

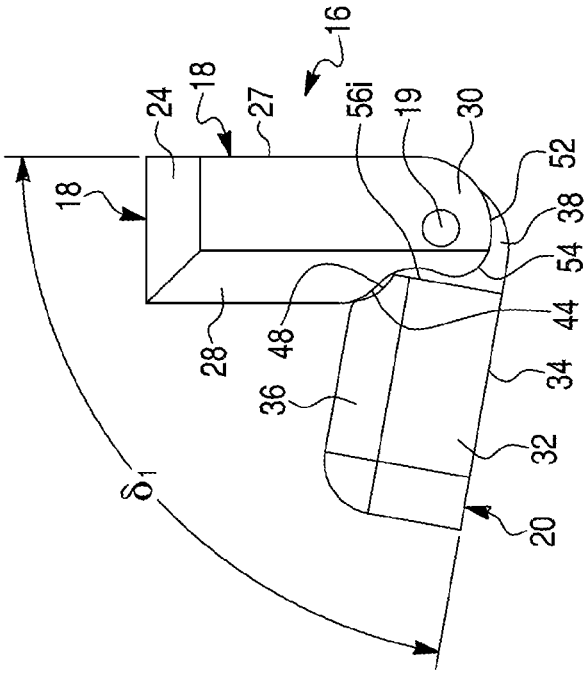
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Fig. 3A

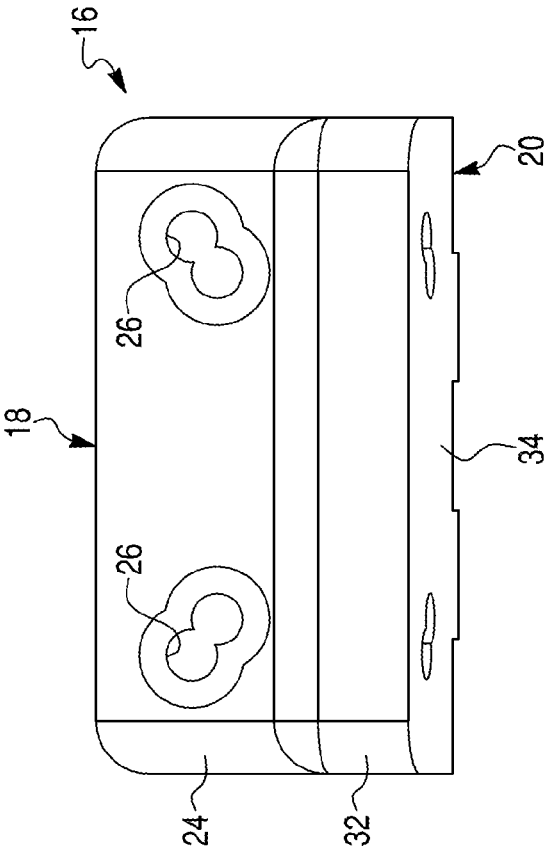
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Fig. 4A

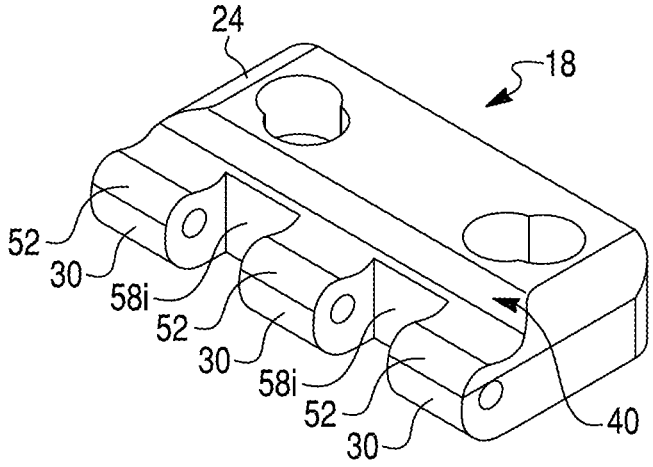
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Fig. 4B

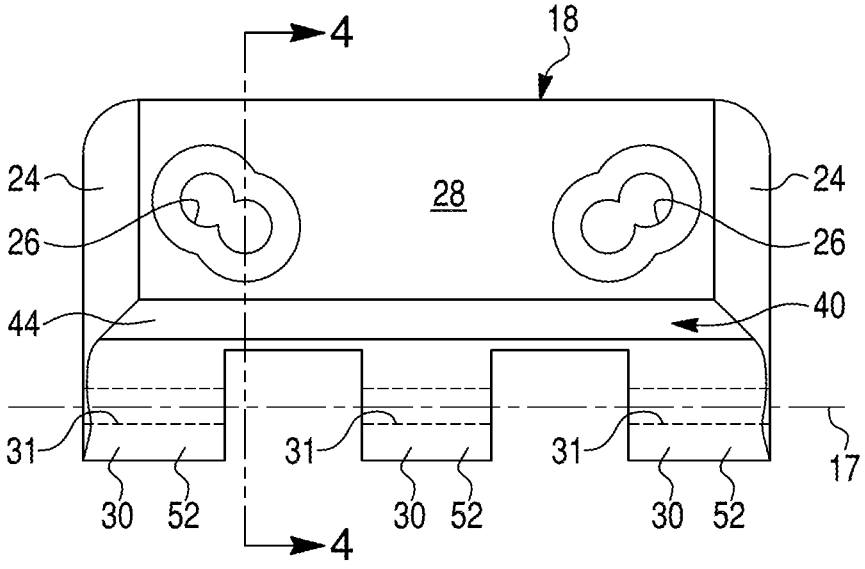
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Fig. 4C

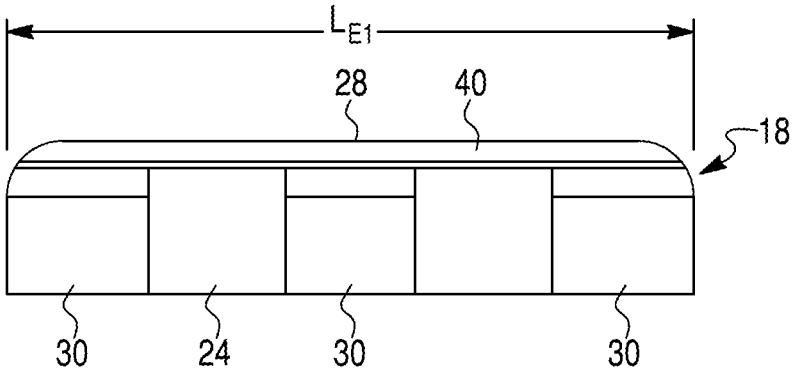

Fig. 4D

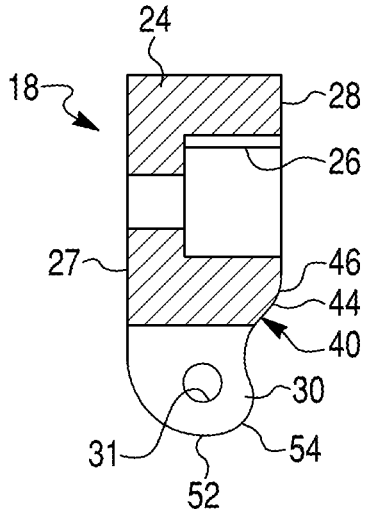

Fig. 5A

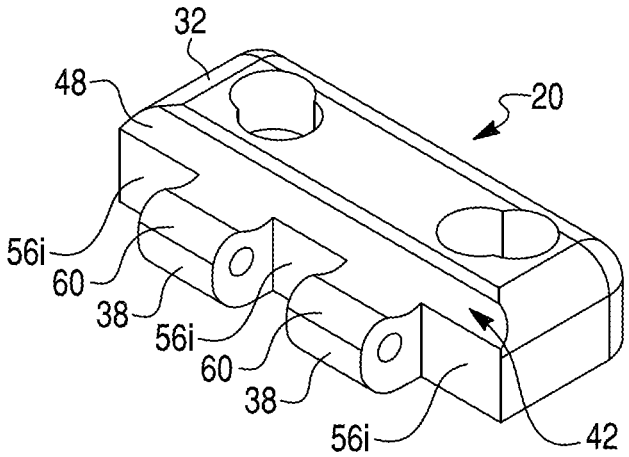
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Fig. 5B

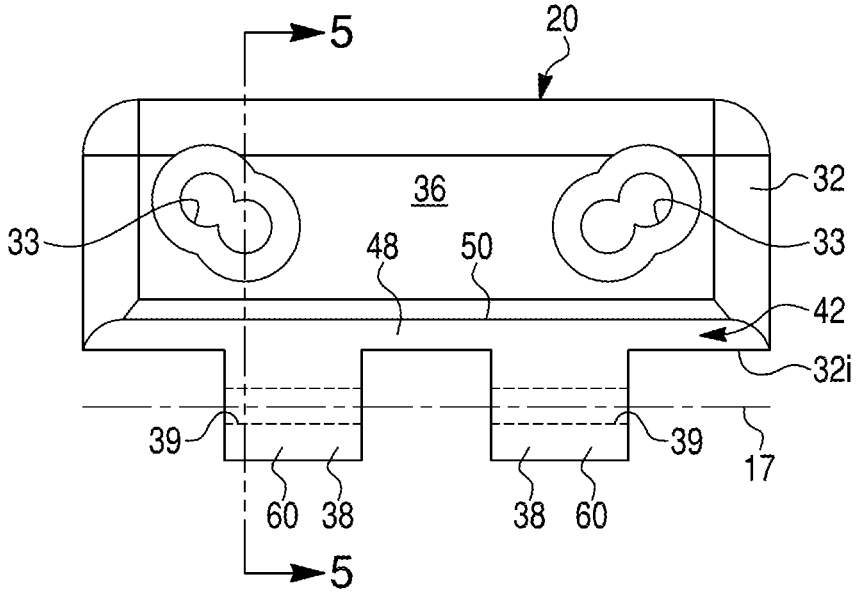
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Fig. 5C

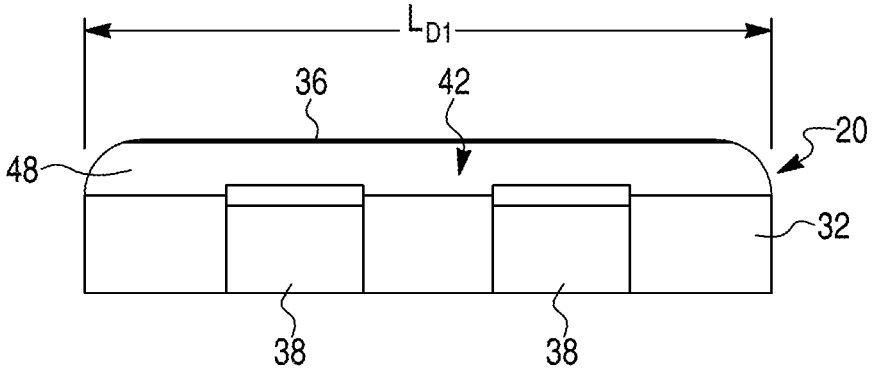


Fig. 5D

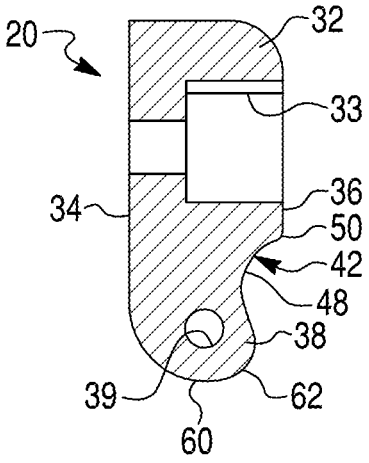


Fig. 6

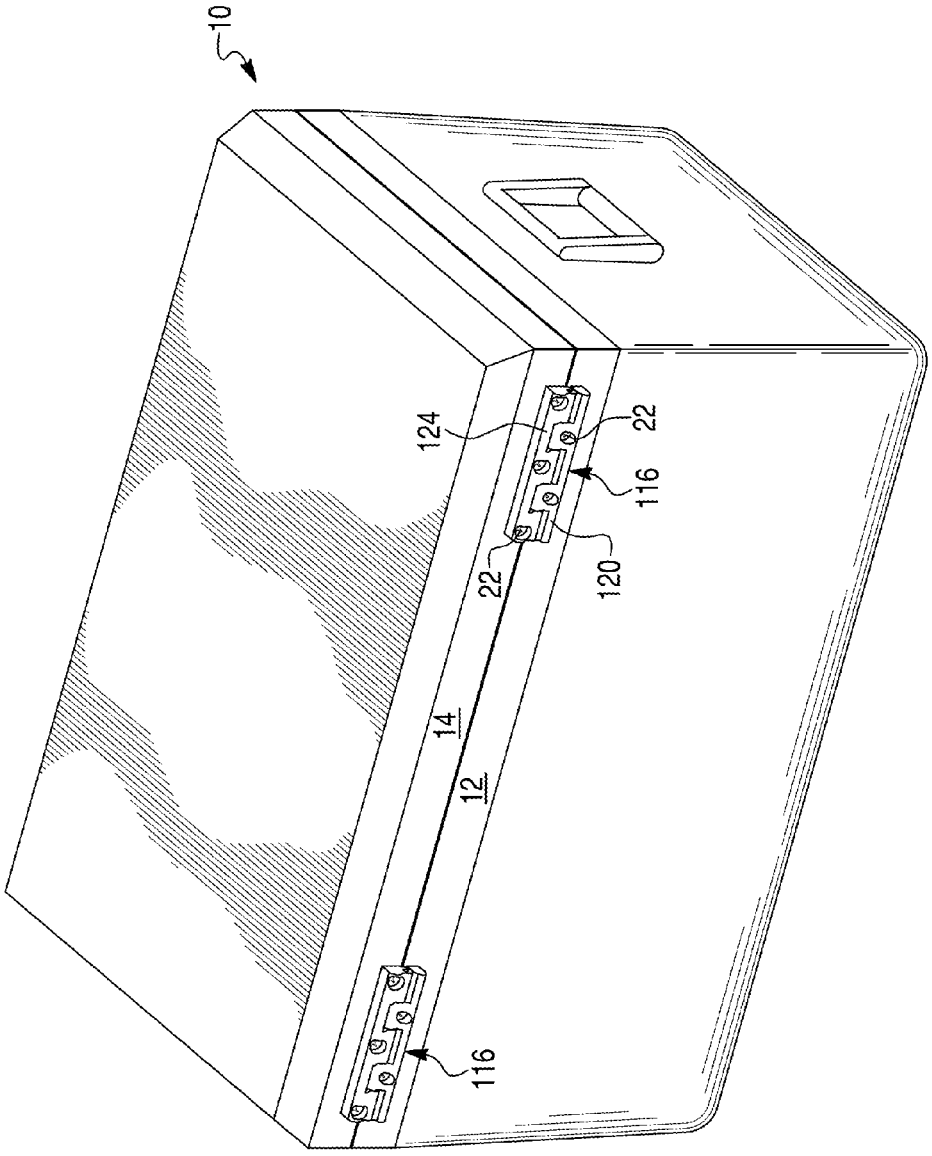


Fig. 7A

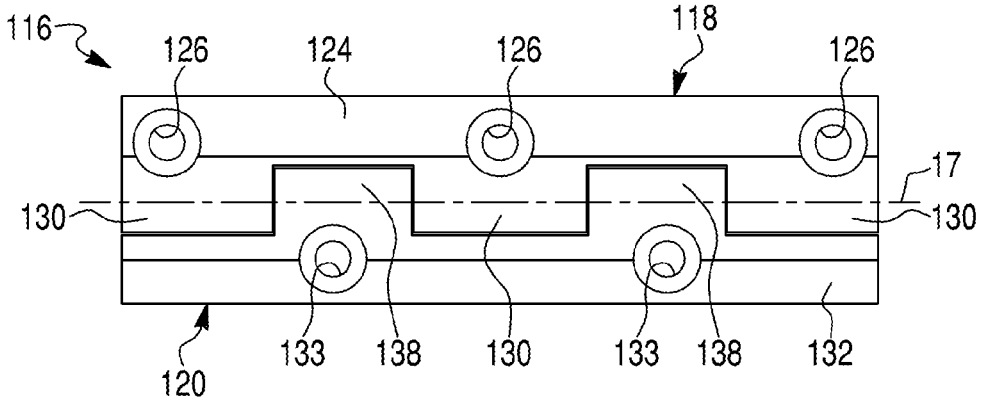


Fig. 8A

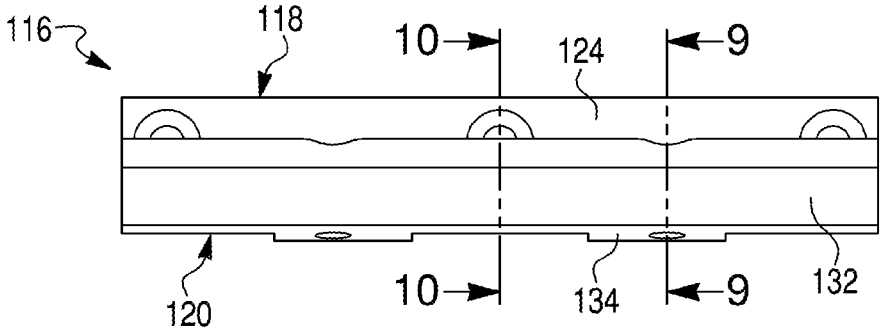


Fig. 7B

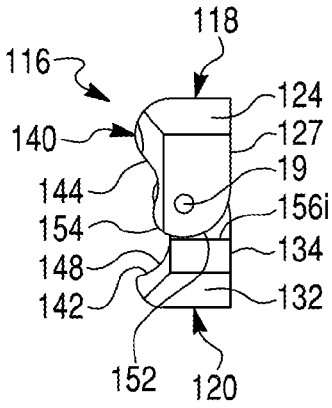


Fig. 8B

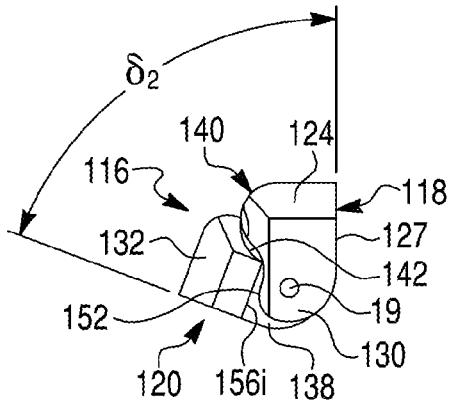


Fig. 9

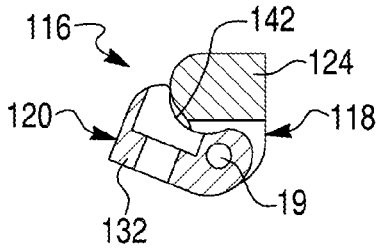


Fig. 10

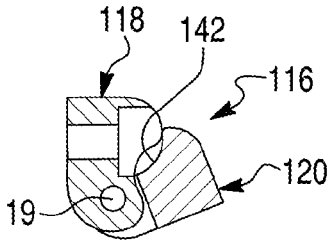


Fig. 11A

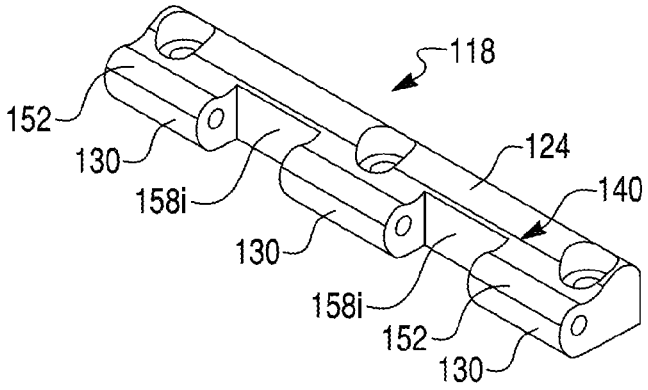


Fig. 11B

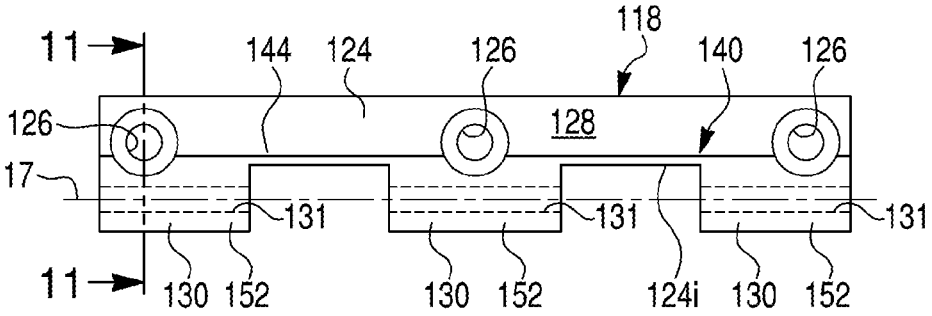


Fig. 11C

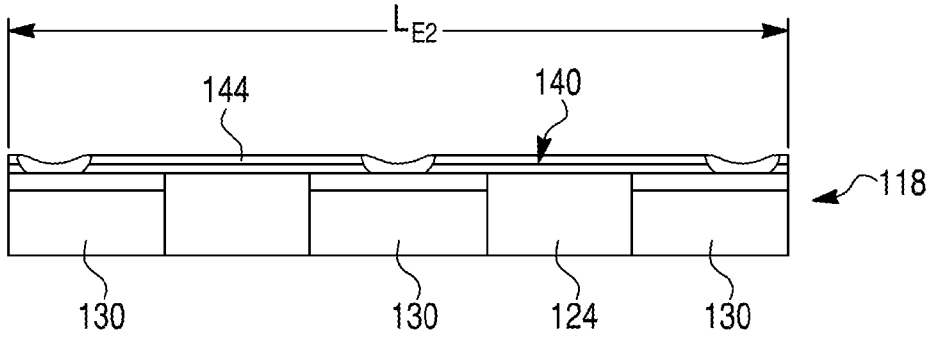


Fig. 11D

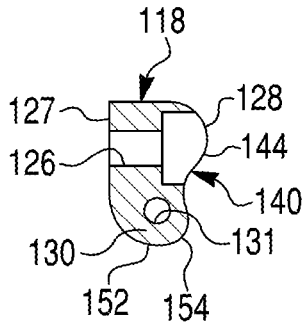


Fig. 12A

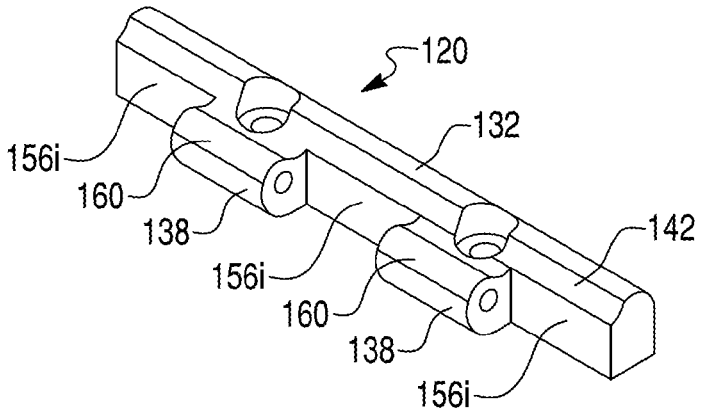


Fig. 12B

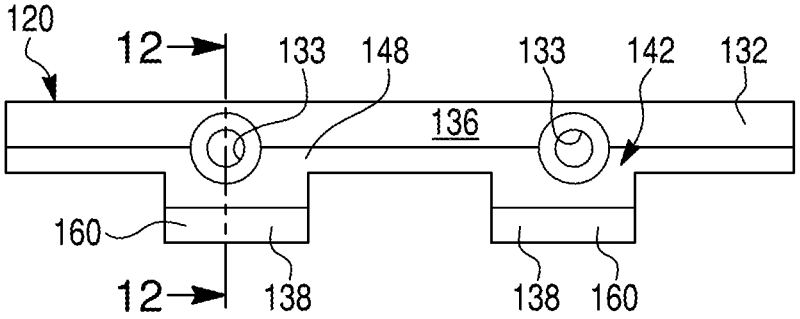


Fig. 12C

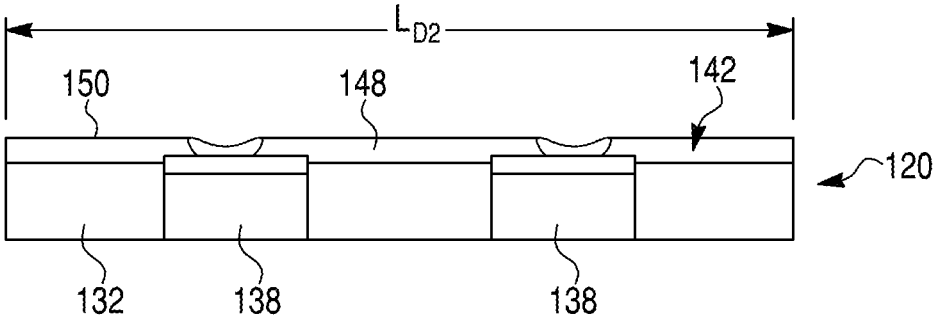
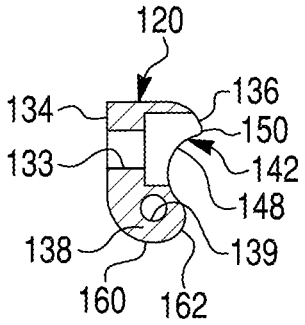


Fig. 12D



HINGE ASSEMBLY FOR LID OF CONTAINER

CROSS-REFERENCE TO RELATED APPLICATION

This application claims the benefit under 35 U.S.C. 119(e) of U.S. Provisional Patent Application Ser. No. 61/845,028 filed Jul. 11, 2013 by Fraser et al., which is hereby incorporated herein by reference in its entirety and to which priority is claimed.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to hinge assemblies in general, and more particularly to a hinge assembly for pivotally connecting a lid to a receptacle of a container.

2. Description of the Related Art

Generally, insulated containers, such as coolers for cold drinks or the like, are well known in the art. Typical insulated containers include a box-like receptacle and a lid mounted thereon and pivotable between open and closed positions. The insulated containers further include hinge assemblies connecting the lid to the receptacle for pivotal movement between open and closed positions. Hinge assemblies are known for pivotally connecting the lid to receptacle of insulated containers. Hinge assemblies are described in, for example, U.S. Pat. Nos. 4,696,412 and 3,962,750.

While hinge assemblies for containers, including but not limited to those discussed above, have proven to be acceptable for typical applications and conditions, improvements that may enhance their performance and cost are possible.

BRIEF SUMMARY OF THE INVENTION

The present invention is directed to a hinge assembly for pivotally connecting a lid to a receptacle of a container.

The hinge assembly according to the present invention comprises a first hinge half including a convex edge portion, and a second hinge half pivotally connected to the first hinge half for pivotable movement between a flattened position and a folded position of the hinge assembly. The second hinge half includes a concave nesting depression nestably engaging the convex edge portion of the first hinge half in the folded position of the hinge assembly.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings are incorporated in and constitute a part of the specification. The drawings, together with the general description given above and the detailed description of the exemplary embodiments and methods given below, serve to explain the principles of the invention. In such drawings:

FIG. **1** is a perspective view of a container with a hinge assembly according to a first exemplary embodiment of the present invention;

FIG. **2**A is a top view of a hinge assembly according to the first exemplary embodiment of the present invention in a flattened position;

FIG. **2**B is a side view of the hinge assembly according to the first exemplary embodiment of the present invention in the flattened position;

FIG. **3**A is a top view of the hinge assembly according to the first exemplary embodiment of the present invention in a folded position;

FIG. **3**B is a side view of the hinge assembly according to the first exemplary embodiment of the present invention in the folded position;

FIG. **4**A is a perspective view of a first hinge half according to the first exemplary embodiment of the present invention;

FIG. **4**B is a top view of the first hinge half according to the first exemplary embodiment of the present invention;

FIG. **4**C is a front view of the first hinge half according to the first exemplary embodiment of the present invention;

FIG. **4**D is a cross-sectional view of the first hinge half according to the first exemplary embodiment of the present invention taken along the lines **4-4** in FIG. **4**B;

FIG. **5**A is a perspective view of a second hinge half according to the first exemplary embodiment of the present invention;

FIG. **5**B is a top view of the second hinge half according to the first exemplary embodiment of the present invention;

FIG. **5**C is a front view of the second hinge half according to the first exemplary embodiment of the present invention;

FIG. **5**D is a cross-sectional view of the second hinge half according to the first exemplary embodiment of the present invention taken along the lines **5-5** in FIG. **5**B;

FIG. **6** is a perspective view of a container with a hinge assembly according to a second exemplary embodiment of the present invention

FIG. **7**A is a top view of a hinge assembly according to the second exemplary embodiment of the present invention in a flattened position;

FIG. **7**B is a side view of the hinge assembly according to the second exemplary embodiment of the present invention in the flattened position;

FIG. **8**A is a top view of the hinge assembly according to the second exemplary embodiment of the present invention in a folded position;

FIG. **8**B is a side view of the hinge assembly according to the second exemplary embodiment of the present invention in the folded position;

FIG. **9** is a cross-sectional view of the hinge assembly according to the second exemplary embodiment of the present invention taken along the lines **9-9** in FIG. **8**A;

FIG. **10** is a cross-sectional view of the hinge assembly according to the second exemplary embodiment of the present invention taken along the lines **10-10** in FIG. **8**A;

FIG. **11**A is a perspective view of a first hinge half according to the second exemplary embodiment of the present invention;

FIG. **11**B is a top view of the first hinge half according to the second exemplary embodiment of the present invention;

FIG. **11**C is a front view of the first hinge half according to the second exemplary embodiment of the present invention;

FIG. **11**D is a cross-sectional view of the first hinge half according to the second exemplary embodiment of the present invention taken along the lines **13-13** in FIG. **5**B;

FIG. **12**A is a perspective view of a second hinge half according to the second exemplary embodiment of the present invention;

FIG. **12**B is a top view of the second hinge half according to the second exemplary embodiment of the present invention;

FIG. **12**C is a front view of the second hinge half according to the second exemplary embodiment of the present invention; and

FIG. **12**D is a cross-sectional view of the second hinge half according to the second exemplary embodiment of the present invention taken along the lines **14-14** in FIG. **14**B;

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

Reference will now be made in detail to exemplary embodiments and methods of the invention as illustrated in the accompanying drawings, in which like reference characters designate like or corresponding parts throughout the drawings. It should be noted, however, that the invention in its broader aspects is not limited to the specific details, representative devices and methods, and illustrative examples shown and described in connection with the exemplary embodiments and methods.

This description of exemplary embodiments is intended to be read in connection with the accompanying drawings, which are to be considered part of the entire written description. In the description, relative terms such as "horizontal," "vertical," "front," "rear," "upper", "lower", "top" and "bottom" as well as derivatives thereof (e.g., "horizontally," "downwardly," "upwardly," etc.) should be construed to refer to the orientation as then described or as shown in the drawing figure under discussion and to the orientation relative to a vehicle body. These relative terms are for convenience of description and normally are not intended to require a particular orientation. Terms concerning attachments, coupling and the like, such as "connected" and "interconnected," refer to a relationship wherein structures are secured or attached to one another either directly or indirectly through intervening structures, as well as both movable or rigid attachments or relationships, unless expressly described otherwise. The term "operatively connected" is such an attachment, coupling or connection that allows the pertinent structures to operate as intended by virtue of that relationship. Additionally, the word "a" as used in the claims means "at least one".

The present invention is related to an insulated container, such as a cooler for cold drinks or the like, generally denoted by reference numeral **10** (as shown in FIGS. **5** and **6**). The container **10** preferably has relatively hard inner and outer plastic shells with suitable insulating material therebetween, such as polyurethane. The container **10** includes a box-like receptacle **12** and a lid **14** mounted thereon and pivotable between open and closed positions. At least two hinge assemblies extends between a rear edge of the receptacle **12** and a rear edge of the lid **14** for connecting the lid **14** to the receptacle **12** for pivotal movement.

FIGS. **1**-**3**B of the drawings illustrate a hinge assembly **16** according to a first exemplary embodiment of the present invention. The hinge assemblies **16**, according to the exemplary embodiments of the present invention, are identical. Each of the hinge assemblies **16** includes a pair of interfitting first (or upper) and second (or lower) hinge halves **18** and **20**, respectively. Specifically, the first (or upper) hinge half **18** is fixedly secured to the lid **14**, while the second (or lower) hinge half **20** is fixedly secured to the receptacle **12** of the container **10**.

The hinge halves **18** and **20** are pivotally connected to each other by a hinge pin **19** so as to be pivotable about a hinge axis **17** between a flattened position (as illustrated in FIGS. **2**A and **2**B) and a folded position (as illustrated in FIGS. **3**A and **3**B). In other words, the hinge halves **18** and **20** of the hinge assembly **16** are in the flattened position when the lid **14** of the container **10** is in the closed position (as illustrated in FIGS. **1**, **2**A and **2**B). Similarly, the hinge halves **18** and **20** of the hinge assembly **16** are in the folded position when the lid **14** of the container **10** is in the open position. The hinge assembly **16** is secured by hinge screws **22** (best shown in FIG. **1**) to the container **10**. The hinge pin **19** is coaxial with the hinge axis **17**.

The hinge halves **18** and **20** may be formed of a suitable molded, self-lubricating, non-corrosive plastic material, such as nylon, styrene, polypropylene, polycarbonate, or reinforced plastic, while the hinge pin **19** may be made of stainless steel. The hinge halves **18** and **20**, according to exemplary embodiments of the present invention, are formed of the acetal plastic material, which is self-lubricating on the hinge pin made of the 304 stainless steel. The acetal plastic material is also food grade, non-corrosive and offers UV protection.

As best illustrated in FIGS. **2**A-**3**B, the first hinge half **18** comprises a first hinge leaf **24** and a plurality of first hinge knuckles **30**. The first hinge leaf **24** has a plurality of openings **26** extending therethrough for receiving the hinge screws **22** or other customary fasteners for attaching the first hinge half **18** to the lid **14**. The hinge assemblies **16** are designed to replace factory installed hinges on containers, such as coolers, made by various manufacturers. Thus, in order to accommodate the containers of different models and/or made by various manufacturers, each of the openings **26** is in the form of a number "8" and comprises two circular holes each provided for receiving the hinge screws **22**. The first hinge leaf **24** also has a planar inner surface **27** configured to engage the rear edge of the lid **14** and a substantially planar outer surface **28**.

As further illustrated in FIGS. **2**A-**3**B, the second hinge half **20** comprises a second hinge leaf **32** and a plurality of second hinge knuckles **38**. The second hinge leaf **32** has a plurality of openings **33** extending therethrough for receiving the hinge screws **22** or other customary fasteners for attaching the second hinge half **20** to the receptacle **12**. Similarly to the first hinge leaf **24**, each of the openings **33** is in the form of a number "8" and comprises two circular holes each provided for receiving the hinge screws **22**. The second hinge leaf **32** also has a planar inner surface **34** configured to engage the rear edge of the receptacle **12** and a substantially planar outer surface **36**. The first and second hinge leaves **24** and **32**, respectively, can be identical or different from each other.

The first hinge knuckles **30** are integrally molded with the first hinge leaf **24** so as to radially extend from an inner edge **24***i* of the first hinge leaf **24**. Moreover, each of the first hinge knuckles **30** has a passage **31** therethrough coaxial with the hinge axis **17**. Similarly, the second hinge knuckles **38** are integrally molded with the second hinge leaf **32** so as to radially extend from an inner edge **32***i* of the second hinge leaf **32**. Each of the second hinge knuckles **38** has a passage **39** therethrough coaxial with the hinge axis **17** when assembled, as best shown in FIG. **2**A. The relative terms such as "axially" and "radially" are with respect to orientations parallel to and perpendicular to the hinge axis **17**, respectively.

As illustrated in FIGS. **2**A, **3**A, **4**A, **4**B, **5**A and **5**B, the first and second hinge knuckles **30** and **38**, respectively, are axially spaced apart and, when assembled, inter-fit to provide a substantially continuous passageway for receiving the hinge pin **19**. Although the first hinge half **18** is illustrated as comprising three first hinge knuckles **30** and the second hinge half **20** is illustrated as comprising two second hinge knuckles **38**, it will be apparent that the number and placement of the hinge knuckles is subject to modification.

The first hinge leaf **24** of the first hinge half **18** is formed with a convex edge portion **40**, while the second hinge leaf **32** of the second hinge half **20** includes a concave nesting depression **42**.

The convex edge portion **40** has a convex surface **44** including a tip (or apex) **46** thereof. In the first exemplary embodiment of the present invention, the apex **46** continuously extends a full length L_E of the convex surface **44** of the convex edge portion **40** and is oriented substantially parallel to the hinge axis **17**. As shown in FIGS. **4**B and **4**D, the convex surface **44** of the edge portion **40** extends between the first hinge knuckles **30** and the outer surface **28** of the first hinge leaf **24**.

In turn, the concave nesting depression **42** has a concave surface **48** extending a length L_{D1} of the concave nesting depression **42** and is oriented substantially parallel to the hinge axis **17**. As shown in FIGS. **5**B and **5**D, the concave surface **48** of the nesting depression **42** extends between the second hinge knuckles **38** and the outer surface **36** of the second hinge leaf **32**. Specifically, the concave surface **48** extends between the inner edge **32***i* of the second hinge leaf **32** and an outer edge **50** of the nesting depression **42**.

In operation, when the lid **14** of the container **10** is lifted and opened, and the hinge assembly **16** is pivotally moved from the flattened position to the folded position thereof, the convex surface **44** of the convex edge portion **40** of the upper hinge half **18** pivots and nestably engages the concave surface **48** of the nesting depression **42** of the lower hinge half **20** along a full length thereof, resulting in an extremely high strength due to full body nesting, positive stop, self-resting locating with a pre-determined angle δ of restraint.

Therefore, the nesting depression **42** of the lower hinge half **20** functions as a positive stop for the upper hinge half **18** of the hinge assembly **16**. The resulting pre-determined angle δ creates an opening angle of the lid **14** that limits the pressure on the hinge screws **22**. According to the exemplary embodiment of the present invention, the resulting pre-determined angle δ is 100°-110°.

Moreover, each of the first hinge knuckles **30** has an outer surface forming an eccentric cam surface **52** including at an apex **54**. The apex **54** forms a high point of the cam surface **52**, i.e., the point on the cam surface **52** farthest from the hinge axis **17**. The distance between the hinge axis **17** and the cam surface **52** is less than the distance between the hinge axis **17** and an inner side surface **56***i* of the second hinge half **20** for the whole length of the cam surface **52** except the apex **54**. In other words, the distance between the hinge axis **17** and the apex **54** of the first hinge knuckle **30** is more than the distance between the hinge axis **17** and an inner side surface **56***i* of the second hinge half **20**.

Therefore, upon an upward swinging of the lid **14** from a closed horizontal position resulting from an upward force, the cam surfaces **52** of the first hinge knuckles **30** engage the inner side surface **56***i* of the second hinge half **20** at the apex **54** of the eccentric cam surface **52**, which restrains the opening movement of the lid **14**. In order for the lid **14** to be opened, sufficient opening force must be applied to the lid **14** so that t the apex **54** of the cam surface **52** slides over the inner side surface **56***i* of the second hinge half **20**. The amount of opening force required may be predetermined by the amount of resilience formed in the inner side surface **56***i* and the amount of eccentricity of the apex **54**.

Likewise, upon pivoting movement to the full open position shown in FIGS. **3**A and **3**B, the inner side surface **56***i* of the second hinge half **20** is past the apex **54** and the apex **54** resists pivoting movement of the lid **14** to a closed position. The amount of closing force required is likewise determined by the amount of resilience in the inner side surface **56***i* and the height or eccentricity of the apex **54** of the cam surface **52**. The hinge assembly **16** of the present invention provides a snap-like latching action adjacent the fully opened and closed positions of the lid **14** with the apex **54** acting as a latch member against the adjacent inner side surface **56***i* of the second hinge half **20**.

Similarly, each of the second hinge knuckles **38** has an outer surface forming an eccentric cam surface **60** including at an apex **62**. The apex **62** forms a high point of the cam surface **60**, i.e., the point on the cam surface **60** farthest from the hinge axis **17**. The distance between the hinge axis **17** and the cam surface **60** is less than the distance between the hinge axis **17** and an inner side surface **58***i* of the first hinge half **18** for the whole length of the cam surface **60** except the apex **62**. In other words, the distance between the hinge axis **17** and the apex **62** of the second hinge knuckle **38** is more than the distance between the hinge axis **17** and the inner side surface **58***i* of the first hinge half **18**. The second hinge knuckles **38** functions similarly in conjunction with the inner side surface **58***i* of the first hinge half **18**, as the first hinge knuckles **30** functions in conjunction with the inner side surface **56***i* of the second hinge half **20**.

FIGS. **6**-**12**D of the drawings illustrate a second exemplary embodiment of a hinge assembly, generally depicted by the reference character **116**. In the interest of brevity, components, which are unchanged from the first exemplary embodiment of the present invention and are discussed above in connection with FIGS. **1**-**5**D, are labeled with the same reference characters and are not further elaborated upon below, except to the extent necessary or useful to explain the additional embodiments of FIGS. **6**-**12**D. Modified components and parts, which function in the same way as in the first exemplary embodiment of the present invention depicted in FIGS. **1**-**5**D, are designated by the same reference numerals to some of which 100 has been added, sometimes without being described in detail since similarities between the corresponding parts in the two embodiments will be readily perceived by the reader.

The hinge assemblies **116**, according to the second exemplary embodiments of the present invention, are identical. Each of the hinge assemblies **116** includes a pair of interfitting first (or upper) and second (or lower) hinge halves **118** and **120**, respectively. The hinge halves **118** and **120** are pivotally connected to each other by a hinge pin **19** and secured by hinge screws **22** to the container **10**. The hinge halves **18** and **20** are pivotally connected to each other by the hinge pin **19** so as to be pivotable between a flattened position (as illustrated in FIGS. **7**A and **7**B) and a folded position (as illustrated in FIGS. **8**A and **8**B).

The hinge halves **118** and **120** may be formed of a suitable molded, self-lubricating, non-corrosive plastic material, such as nylon, styrene, polypropylene, polycarbonate, or reinforced plastic. The hinge halves **118** and **120**, according to the second exemplary embodiments of the present invention, are formed of the acetal plastic material, which is self-lubricating on the hinge pin made of the 304 stainless steel. The acetal plastic material is also food grade, non-corrosive and offers UV protection.

As best illustrated in FIGS. **7**A-**8**B and **11**A-**11**B, the first hinge half **118** comprises a first hinge leaf **124** and a plurality of first hinge knuckles **130**. The first hinge leaf **124** has a plurality of openings **126** extending therethrough for receiving the hinge screws **22** or other customary fasteners for attaching the first hinge half **118** to the lid **14**. The hinge assemblies **116** are designed to replace factory installed hinges on containers, such as coolers, made by various manufacturers. The first hinge leaf **124** also has a planar inner surface **127** configured to engage the rear edge of the lid **14** and an outer surface **128**.

As further illustrated in FIGS. **7**A-**8**B and **12**A-**12**B, the second hinge half **120** comprises a second hinge leaf **132** and a plurality of second hinge knuckles **138**. The second hinge leaf **132** has a plurality of openings **133** extending therethrough for receiving the hinge screws **22** or other customary fasteners for attaching the second hinge half **120** to the receptacle **12**. The second hinge leaf **132** also has a planar inner surface **134** configured to engage the rear edge of the receptacle **12** and an outer surface **136**.

The first hinge knuckles **130** are integrally molded with the first hinge leaf **124** so as to extend from an inner edge **124***i* of the first hinge leaf **24** (shown in FIG. **11**B). Moreover, each of the first hinge knuckles **130** has a passage **131** therethrough defining a hinge axis **17**. Similarly, the second hinge knuckles **138** are integrally molded with the second hinge leaf **132** so as to extend from an inner edge **132***i* of the second hinge leaf **132** (shown in FIG. **12**B). Each of the second hinge knuckles **138** has a passage **139** therethrough coaxial with the hinge axis **17** when assembled, as best shown in FIG. **7**A.

As illustrated in FIGS. **7**A, **8**A, **11**A, **11**B, **12**A and **12**B, the first and second hinge knuckles **130** and **138**, respectively, are axially spaced apart and, when assembled, inter-fit to provide a substantially continuous passageway for receiving the hinge pin **19**. Although the first hinge half **118** is illustrated as comprising three first hinge knuckles **130** and the second hinge half **120** is illustrated as comprising two second hinge knuckles **138**, it will be apparent that the number and placement of the hinge knuckles is subject to modification.

The first hinge leaf **124** of the first hinge half **118** is formed with a convex edge portion **140**, while the second hinge leaf **132** of the second hinge half **120** includes a concave nesting depression **142**.

The convex edge portion **140** has a convex surface **144** including a tip (or apex) **146** thereof. In the first exemplary embodiment of the present invention, the apex **146** extends substantially a full length L_{E2} of the convex surface **144** of the convex edge portion **140** and is oriented substantially parallel to the hinge axis **17**.

In turn, the concave nesting depression **142** has a concave surface **148** extending a length L_{D2} and is oriented substantially parallel to the hinge axis **17**. As shown in FIGS. **12**B and **12**D, the concave surface **148** of the nesting depression **142** extends between the second hinge knuckles **138** and the outer surface **136** of the second hinge leaf **32**. Specifically, the concave surface **148** extends between the inner edge **132***i* of the second hinge leaf **132** and an outer edge **150** of the nesting depression **142**.

In operation, when the lid **14** of the container **10** is lifted and opened, and the hinge assembly **116** is pivotally moved from the flattened position to the folded position thereof, the convex surface **144** of the edge portion **140** of the upper hinge half **118** pivots and nestably engages the concave surface **148** of the nesting depression **142** of the lower hinge half **120** along a full length thereof, resulting in an extremely high strength due to full body nesting, positive stop, self-resting locating with a pre-determined angle δ of restraint.

Therefore, the nesting depression **142** of the lower hinge half **120** functions as a positive stop for the upper hinge half **118** of the hinge assembly **116**. The resulting pre-determined angle δ creates an opening angle of the lid **114** that limits the pressure on the hinge screws **22**. According to the second exemplary embodiment of the present invention, the resulting pre-determined angle δ_2 is about 70°-80°.

Moreover, each of the first hinge knuckles **130** has an outer surface forming an eccentric cam surface **152** including at an apex **154**. The apex **154** forms a high point of the cam surface **152**, i.e., the point on the cam surface **152** farthest from the hinge axis **17**. The distance between the hinge axis **17** and the cam surface **152** is less than the distance between the hinge axis **17** and an inner side surface **156***i* of the second hinge half **120** for the whole length of the cam surface **152** except the apex **154**. In other words, the distance between the hinge axis **17** and the apex **154** of the first hinge knuckle **130** is more than the distance between the hinge axis **117** and an inner side surface **156***i* of the second hinge half **120**.

Therefore, upon an upward swinging of the lid **14** from a closed horizontal position resulting from an upward force, the cam surfaces **152** of the first hinge knuckles **130** engage the inner side surface **156***i* of the second hinge half **20** at the apex **154** of the eccentric cam surface **152**, which restrains the opening movement of the lid **14**. In order for the lid **14** to be opened, sufficient opening force must be applied to the lid **14** so that t the apex **154** of the cam surface **152** slides over the inner side surface **156***i* of the second hinge half **120**. The amount of opening force required may be predetermined by the amount of resilience formed in the inner side surface **156***i* and the amount of eccentricity of the apex **154**.

Likewise, upon pivoting movement to the full open position shown in FIGS. **8**A, **8**B, **9** and **10**, the inner side surface **156***i* of the second hinge half **120** is past the apex **154** and the apex **154** resists pivoting movement of the lid **14** to a closed position. The amount of closing force required is likewise determined by the amount of resilience in the inner side surface **156***i* and the height or eccentricity of the apex **154** of the cam surface **152**. The hinge assembly **116** of the present invention provides a snap-like latching action adjacent the fully opened and closed positions of the lid **14** with the apex **154** acting as a latch member against the adjacent inner side surface **156***i* of the second hinge half **120**.

Similarly, each of the second hinge knuckles **138** has an outer surface forming an eccentric cam surface **160** including at an apex **162**. The apex **162** forms a high point of the cam surface **160**, i.e., the point on the cam surface **160** farthest from the hinge axis **17**. The distance between the hinge axis **17** and the cam surface **160** is less than the distance between the hinge axis **17** and an inner side surface **158***i* of the first hinge half **118** for the whole length of the cam surface **160** except the apex **162**. In other words, the distance between the hinge axis **17** and the apex **162** of the second hinge knuckle **138** is more than the distance between the hinge axis **17** and the inner side surface **158***i* of the first hinge half **118**. The second hinge knuckles **138** functions similarly in conjunction with the inner side surface **158***i* of the first hinge half **118**, as the first hinge knuckles **130** functions in conjunction with the inner side surface **156***i* of the second hinge half **120**.

The hinge assembly according to the exemplary embodiments of the present invention has the following advantages over the conventional practice in the art: high strength and full body nesting, positive stop, self resting, controlled motion, pre-determined angle restraint, self lubrication, UV protective acetal injection molded material, food grade, corrosion resistance.

The foregoing description of the exemplary embodiments of the present invention has been presented for the purpose of illustration in accordance with the provisions of the Patent Statutes. It is not intended to be exhaustive or to limit the invention to the precise forms disclosed. Obvious modifications or variations are possible in light of the above teachings. The embodiments disclosed hereinabove were chosen in order to best illustrate the principles of the present

invention and its practical application to thereby enable those of ordinary skill in the art to best utilize the invention in various embodiments and with various modifications as are suited to the particular use contemplated, as long as the principles described herein are followed. Thus, changes can be made in the above-described invention without departing from the intent and scope thereof. It is also intended that the scope of the present invention be defined by the claims appended thereto.

What is claimed is:

1. A hinge assembly for pivotally connecting a lid to a receptacle of a container, said hinge assembly comprising:

a first hinge half comprising a first hinge leaf and a first hinge knuckle extending from the first hinge leaf, said first hinge leaf comprising a first outer surface, a first inner edge past which said first hinge knuckle extends, and a convex edge portion having a convex surface extending between said first inner edge and said first outer surface; and

a second hinge half comprising a second hinge leaf and a second hinge knuckle extending from said second hinge leaf and being pivotally connectable to said first hinge knuckle of said first hinge half for pivotable movement about a hinge axis between a flattened position and a folded position of said hinge assembly, said second hinge leaf comprising a second outer surface, a second inner edge past which said second hinge knuckle extends, and a concave nesting depression having a concave surface extending between said second inner edge and said second outer surface, said concave nesting depression of said second hinge leaf nestably engaging said convex edge portion of said first hinge leaf in said folded position of said hinge assembly.

2. The hinge assembly as defined in claim **1**, further comprising a hinge pin coaxial with said hinge axis and pivotally connecting said first and second hinge halves to each other.

3. The hinge assembly as defined in claim **1**, wherein said concave nesting depression nestably engages said convex edge portion of the first hinge half along a full length of said convex edge portion in said folded position of said hinge assembly.

4. The hinge assembly as defined in claim **1**, wherein said convex surface has an apex; and wherein said apex of said convex surface nestably engages said concave surface in said folded position of said hinge assembly.

5. The hinge assembly as defined in claim **1**, wherein said convex edge portion has an apex continuously extending a full length of said convex surface and oriented substantially parallel to said hinge axis; wherein said concave surface extends a full length of said concave nesting depression and is oriented substantially parallel to said hinge axis; and wherein said apex of said convex surface nestably engages said concave surface along said full length of said convex surface in said folded position of said hinge assembly.

6. The hinge assembly as defined in claim **1**, wherein said first hinge knuckle comprises a plurality of first hinge knuckles, and said second knuckle comprises a plurality of second hinge knuckles inter-fitted with said first hinge knuckles.

7. The hinge assembly as defined in claim **6**, further comprising a hinge pin coaxial with said hinge axis and pivotally connecting said first and second hinge halves to each other; wherein each of said first and second hinge knuckles has a passage therethrough coaxial with said hinge axis; and wherein said passages receiving said hinge pin therethrough.

8. The hinge assembly as defined in claim **6**, wherein said convex edge portion is formed on said first hinge leaf; wherein said concave nesting depression is formed on said second hinge leaf; wherein said first and second hinge leaves are formed from a member selected from the group consisting of nylon, styrene, polypropylene, polycarbonate and reinforced plastic.

9. The hinge assembly as defined in claim **6**, wherein said first hinge knuckles are formed integrally with said first hinge leaf; and wherein said second hinge knuckles are formed integrally with said second hinge leaf.

10. The hinge assembly as defined in claim **6**, wherein said first hinge leaf has a plurality of first openings extending therethrough, and wherein said second hinge leaves has a plurality of second openings extending therethrough.

11. A container comprising:

a box-shaped receptacle;

a lid mounted on said box-shaped receptable and pivotable between open and closed positions; and

a hinge assembly pivotally connecting said lid to said receptacle, said hinge assembly comprising

a first hinge half fixedly secured to said lid and comprising a first hinge leaf and a first hinge knuckle extending from said first hinge leaf, said first hinge leaf comprising a first outer surface, a first inner edge past which said first hinge knuckle extends, and a convex edge portion having a convex surface extending between said first inner edge and said first outer surface; and

a second hinge half fixedly secured to said receptacle and comprising a second hinge leaf and a second hinge knuckle extending from said second hinge leaf, said second hinge knuckle being pivotally connected to said first hinge knuckle of said first hinge half for pivotable movement about a hinge axis between a flattened position and a folded position of said hinge assembly, said second hinge leaf comprising a second outer surface, a second inner edge past which said second hinge knuckle extends, and a concave nesting depression having a concave surface extending between said second inner edge and said second outer surface, said concave nesting depression of said second hinge leaf nestably engaging said convex edge portion of said first hinge leaf in said folded position of said hinge assembly.

12. The container as defined in claim **11**, wherein said hinge assembly further comprises a hinge pin coaxial with said hinge axis and pivotally connecting said first and second hinge halves to each other.

13. The container as defined in claim **11**, wherein said concave nesting depression nestably engages said convex edge portion of said first hinge leaf along a full length of said convex edge portion in said folded position of said hinge assembly.

14. The container as defined in claim **11**, wherein said convex surface has an apex; and wherein said apex of said concave surface nestably engages said concave surface in said folded position of said hinge assembly.

15. The container as defined in claim **11**, wherein said convex surface has an apex continuously extending a full length of said convex surface and oriented substantially parallel to said hinge axis; wherein said concave surface extends a full length of said concave nesting depression and is oriented substantially parallel to said hinge axis; and

wherein said apex of said convex surface nestably engages said concave surface along said full length of said convex surface in said folded position of said hinge assembly.

16. The container as defined in claim **11**, wherein said first hinge knuckles comprises a plurality of first hinge knuckles, and said second hinge knuckle comprises a plurality of second hinge knuckles inter-fitted with said first hinge knuckles.

17. The container as defined in claim **16**, further comprising a hinge pin coaxial with said hinge axis and pivotally connecting said first and second hinge halves to each other; wherein each of said first and second hinge knuckles has a passage therethrough coaxial with said hinge axis; and wherein said passages receiving said hinge pin therethrough.

18. The hinge assembly as defined in claim **16**, wherein said convex edge portion is formed on said first hinge leaf; wherein said concave nesting depression is formed on said second hinge leaf; and wherein said first and second hinge leaves are formed from a member selected from the group consisting of nylon, styrene, polypropylene, polycarbonate and reinforced plastic.

19. The container as defined in claim **16**, wherein said first hinge knuckles are formed integrally with said first hinge leaf; and wherein said second hinge knuckles are formed integrally with said second hinge leaf.

20. The container as defined in claim **16**, wherein said first hinge leaf has a plurality of first openings extending therethrough for receiving hinge fasteners for attaching said first hinge half to said receptacle; and wherein said second hinge leaf has a plurality of second openings extending therethrough for receiving hinge fasteners for attaching said second hinge half to said lid.

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